



UST CONVERSION FOR STORAGE AND DISPENSING OF BIOFUELS
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DIVISION OF WASTE MANAGEMENT
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Introduction.

With the expanding production of biofuels, there has been a corresponding increase in the number of retail facilities storing and dispensing renewable fuels such as ethanol and biodiesel. Oftentimes, the same underground storage tank (UST) systems that are used to store and dispense gasoline and diesel fuel are used for biofuels, including higher-percentage ethanol-blended gasoline (greater than 10% ethanol by volume).

It is important to understand that biofuels have significantly different characteristics from petroleum gasoline and diesel, and ***certain precautions and procedures must be followed when converting an UST system to the storage of biofuels.*** The foremost concern when converting an UST system for the storage of higher-percentage ethanol-blended fuel is system compatibility. The North Dakota UST rules (NDAC 33-24-08-22) require UST systems to be made of or lined with materials that are compatible with the substance stored in them. The tank system includes the underground storage tank, connected underground piping, all ancillary equipment and containment system, if any.

Secondly, the North Dakota Petroleum and Fuel Product rules (NDAC 33-34-01-02) require all alcohol-blended gasoline sold or offered for sale to be labeled with the name of the alcohol contained in the gasoline. The dispensing unit label must also identify the maximum percentage by volume, to the nearest whole percent, of ethanol contained in the alcohol-blended gasoline. It should be noted that the use of gasoline containing ethanol amounts greater than E-10 in a gasoline-only vehicle is *prohibited* under the federal Clean Air Act. *[Note: Both the marketer and consumer may be subject to federal penalties for improperly fueling non-flexible-fueled vehicles with greater than E-10 blends.]* High-percentage ethanol-blended fuel should be dispensed from a hose that is separate from a normal gasoline or E-10 hose and clearly marked as being appropriate for use only by ethanol flexible-fueled vehicles (FFVs).

Compatibility. Higher-percentage ethanol-blended fuels do not have the same compatibility characteristics of conventional fuels when it comes to storage and dispensing. Soft metals such as zinc, brass or aluminum, which are commonly found in conventional fuel storage and dispensing systems, are not compatible with E85. *Fiberglass and steel tanks and piping must be UL Marked or certified by the manufacturer for use with higher-percentage ethanol-blended fuels.*

Nonmetallic materials that degrade when in contact with fuel ethanol include natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics, and certain thermoplastic and thermoset polymers.

The U.S. Environmental Protection Agency (EPA) has developed a web-based compendium that provides information regarding storing ethanol and biodiesel fuels and includes information pertaining to equipment compatibility with ethanol. Information concerning equipment compatibility can be found at this site and can be accessed at www.epa.gov/swerust1/altfuels/ethcompat.htm.

Phase Separation. Ethanol mixes completely in water. Ethanol also blends well with gasoline. When water infiltrates a tank, (e.g., through sump covers and loose fittings at

the top of the tank), the ethanol in the ethanol-blended gasoline will absorb the water. If enough water is present in the tank, it will overwhelm the ethanol's capacity to remain blended with the gasoline, and because it mixes easier with water, the ethanol will be drawn from the gasoline into the water at the bottom of the tank, separating from the gasoline. When this happens, the product in the tank is no longer a blend of ethanol and gasoline, but two layers of product: a layer of gasoline on top and a layer of ethanol/water mixture on the bottom. Phase separation can affect vehicle performance because the product is no longer an ethanol blend.

Accelerated Corrosion and Conductivity. Ethanol can accelerate corrosion in steel UST systems by scouring or loosening deposits on the internal surfaces of the tank and piping. If an area of corrosion exists, the ethanol can accelerate (scour) the corroded area and cause a perforation. As mentioned above, ethanol is not compatible with "soft" metals such as zinc, brass, copper, lead and aluminum. These metals will degrade or corrode in contact with ethanol and can contaminate a vehicle's fuel system.

Tank leak detection equipment (e.g., automatic tank gauge – ATG) composed of soft metals, polymers and elastomers may not be compatible with ethanol. Because ethanol has a higher conductivity than gasoline, capacitance probes will not work in ethanol-blended fuels. Tank system owners/operators should verify the floats used in magnetostrictive probes are alcohol compatible and the ATG system is properly calibrated for ethanol.

Process for Converting a Gasoline or Diesel System. The conversion to a high-percentage ethanol-blended fuel requires time and effort to evaluate existing equipment, verify compatibility and change out equipment that is not compatible. A step-by-step process for converting a diesel or gasoline system to an E-85 system can be found at www.afdc.energy.gov/afdc/ethanol/converting_petroleum.html.

In general, all petroleum fuel first must be emptied. Secondly, all residue from the tank bottom must be cleaned out. Special detail should be paid to tanks that have held diesel fuel to ensure that any remaining diesel is removed. The owner/operator will want to conduct a tightness test on the system to guard against loose fittings or leaks that might have developed during cleaning.

Some additional procedures that should be followed when converting a tank system to a high-percentage ethanol blend include a thorough review of the entire fuel delivery system and the confirmation of compatibilities prior to the introduction of ethanol or ethanol-blended fuels. Owners/operators should contact their petroleum equipment supplier or installer to discuss converting to a higher-percentage ethanol blend and replace existing components with the appropriate components/equipment, if not compatible. ***If an owner/operator is installing a higher-percentage blender pump, they will need to obtain and complete SFN-59146.***

The following equipment/components/materials must be compatible with the ethanol blend that will be stored and dispensed:

- Auto shutoff or overfill valve
- Tank and tank liners (i.e., warranty conditions, manufacturer's approval or UL listing, etc.)
- Submersible pump, gaskets and O-rings
- Line leak detectors – leak detection equipment (ATG probes, floats, sump sensors)
- Piping material (i.e., manufacturer's approval or UL listing)
- Any metal fittings or system parts

- Flex connectors, grommets
- Filters
- Dispensers and hanging hardware
- Spill containment and sumps

First Delivery and Ongoing Maintenance. Prior to initial delivery of the higher ethanol-blended fuel, a check of the storage tanks for any water accumulation should be performed. Further, the Renewable Fuels Association (RFA) recommends the following measures also be taken:

- Follow normal delivery procedures, which should include safety, inventory and pump reading requirements.
- Verify that the fuel delivery driver is putting the correct compartment of fuel in the correct storage tank.
- Turn off retail fuel pumps at the breaker during initial conversion delivery.
- Once ethanol-blended fuel is available for sale, verify the correct accounting procedures for the fuel.
- Check tanks for water accumulation once every 48 hours, as well as verify the proper operation of the tank filtration equipment.

Additional information regarding fuel storage conversion procedures is provided by the Renewable Fuels Association and can be found at www.ethanolRFA.org/industry/resources.

Need more information?

Visit the UST Program at www.ndhealth.gov. The site has forms, fact sheets and other information about USTs and UST requirements.

You can also call the North Dakota Department of Health at 701.328.5166.